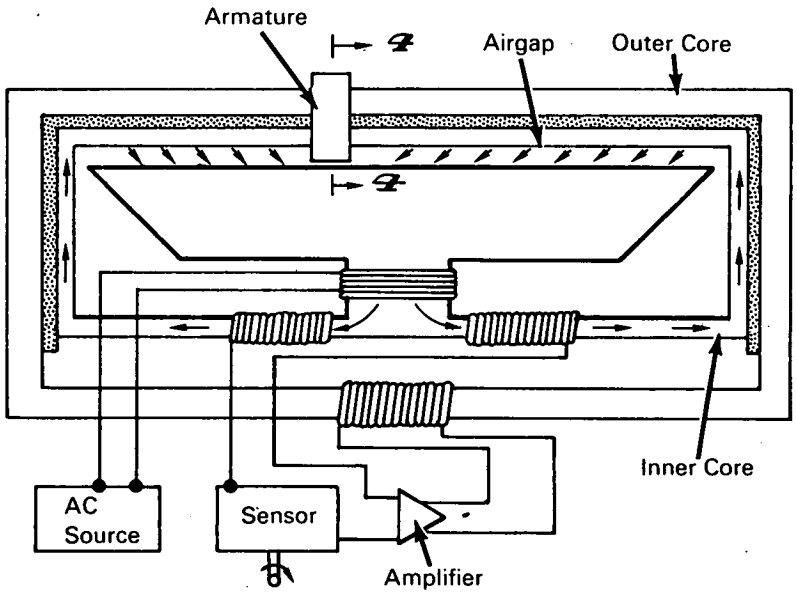
NASA TECH BRIEF

Alternating Current Electromagnetic Servo Induction Meter



The problem:

A simple and reliable display instrument is required for use in high performance flight research aircraft to accurately indicate the responses of various sensors to conditions encountered in flight. Prior devices, while satisfactory, have imposed weight and space penalties, due to their complexity, that are undesirable in an already cluttered instrument panel.

The solution:

A simple electromagnetic device that responds to sensor inputs to move a slideable armature along an indicator scale by the force of currents induced in the armature winding. The armature is the only moving part in the device and has a single winding.

How it's done:

The instrument has an inner core and an outer core around which a slideable armature, having a single turn of conductor material, is connected. The top of the outer core is scribed to form an incremental scale determining armature travel. The inner core consists of two members that form an airgap between them. An ac excited coil, on the central member, generates a reversing flux flow in the core to establish a reversing magnetic field in the airgap. The armature conductor extends through the airgap to form a flux barrier that effectively divides the inner core into two halves. Flux flow through each half is controlled by the length of its airgap as determined by the position of the armature.

The two coils about the lower side of the inner core have current flow induced in them by the flux flowing in the inner core, their output magnitudes and polarities being determined by the position of the armature. The outputs of these two coils (or either of them) and of the sensor are compared and when a correction is

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needed to the position of the armature, a signal is fed to the amplifier which excites the coil around the lower portion of the outer core. This generates a reversing flux flow in the outer core to induce current flow in the armature. Induced current flowing in the airgap magnetic field applies a force to the armature, causing it to move along the scale to a point that correctly indicates the sensed condition. Magnitude and direction of the force acting on the armature are varied by controlling the magnitude and phase angle relationship of the airgap magnetic field and the current induced in the armature.

Patent status:

This is the invention of a NASA employee, and U.S. Patent No. 3,341,834 has been issued to him. Inquiries about obtaining license rights for its commercial development should be addressed to the inventor, Mr. R. K. Bogue at Flight Research Center, Edwards Air Force Base, California 93523.

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